<u>Final Exam Information</u>

Date: 4/28/2022
Time: 1 PM – 3:50 PM
Room: CB2 – 207

The questions will vary from short answer, to tracing, to perhaps a bit of coding.

Since there's a lot to remember algorithm wise, I'll allow you to use four 8.5"x11" sheets of notes, front and back.

Final Exam Review Outline

I. Use of Java Data Structures, Java Features
- a. ArrayList, LinkedList, ArrayDeque
- b. TreeSet, TreeMap
- c. HashSet, HashMap
- d. PriorityQueue
- e. Custom Sorting

II. Backtracking

III. Data Structures
- a. Disjoint Sets
- b. 2-4 Trees
- c. Red-Black Trees
- d. Skip Lists

IV. Algorithm Analysis
- a. Accurate O, Ω, Θ definitions
- b. Master Theorem
- c. Expectation Definition
- d. Binomial Theorem
- e. Binary Search Average Case Run Time
- f. Make Heap Worst Case Run Time
- g. Quick Select Average Case Run Time

IV. Sorting
- a. Lower Bound for Adjacent Element Swap Sorts
- b. Lower Bound for Comparison Sorts
- c. Bucket Sort
- d. Counting Sort
- e. Radix Score

V. Greedy Algorithms

- **a. Fractional Knapsack**
- **b. Single Room Scheduling**
- **c. Multiple Room Scheduling**
- **d. Change**

- **h. Huffman Coding**

VI. Unweighted Graphs

- **a. Definition & Different Types**
- **b. Depth First Search**
- **c. Breadth First Search**
- **d. Topological Sort**

VII. Weighted Graphs

- **a. Dijkstra’s**
- **b. Prim’s**
- **c. Kruskal’s**
- **d. Network Flow**

VII. Divide and Conquer

- **a. Integer Multiplication**
- **b. Tromino "Tiling"**
- **c. Skyline Problem**
- **d. Closest Pair of Points**
- **e. Strassen’s Algorithm**

VIII. Dynamic Programming

- a. Fibonacci
- b. Combinations
- c. Longest Common Subsequence
- d. Number of Ways to Make Change
- e. Fewest Number of Coins to Make Change
- f. 0-1 Knapsack Problem
- g. Floyd-Warshall's Algorithm and path reconstruction
- h. Matrix Chain Multiplication
- i. Edit Distance
- j. Road Optimization Problem Idea

IX. Probabilistic Algorithms

- a. Fermat’s Theorem
- b. Miller-Rabin Primality Test
- c. Rolling Hash Function Calculation and String Matching